Costing Infection Prevention Efforts

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Abstract

Nineteen papers were found. Three described only the costs of nosocomial infection and so provided limited information about whether or not infection prevention efforts should be changed. One was about the costs of making alcohol based hand run in low income countries. Eight papers showed the extra costs and cost savings from changing infection prevention, and discussed the health benefits, all concluding that the changes were economically worthwhile. There was a useful systematic review of MRSA control and a useful methods paper on how to cost prevention efforts. The last five were not related to hospital infection control. Overall, the balance has shifted away from studies that report the high cost of infections to more useful papers that address the value for money of infection prevention. Good quality work in this area needs to continue as many gaps exist in knowledge.

Text

A search of PubMed for articles with the word "cost" in the title and "infection prevention" in any other field revealed nineteen papers arising January 2013 to February 2014. Three had no information about the costs of prevention efforts, rather the costs of the health and clinical consequences of infection were reported. Kaye et al. [1] did a retrospective cohort study for eight acute care hospitals matching 830 cases of blood stream infection to an equal number of controls. The mean extra length of stay and costs attributable to infection were estimated at 10 days and $43,208. Lloyd Smith et al. [2] used a generalized linear model to estimate attributable costs and length of stay from vancomycin-resistant enterococcus in an acute care hospital in Canada. They found a case of infection increased length of stay by 13.8 days. Tansarli et al. [3] reviewed literature to find estimates of the hospital costs arising from antimicrobial multidrug resistance. They concluded these to be alarmingly high and suggested this was a justification for the application of strict infection control measures in medical institutions with increased rate of MDR infections. These papers, and others like them, only partially inform economic decisions to invest in infection control programs. They

only tell us what resources or costs might be saved by an effective program. They fail to provide information about the change to life years gained from making an investment, or the cost of infection prevention efforts. Good economic decisions require data on how total costs will change, implementation costs and cost savings; and then, how many life years, or quality adjusted life years, will be returned for a the observed change to cost [4]. The cost per life year gained can then be estimated and allows sensible comparison with all other competing programs that benefit health. These statistics inform a policy of maximising health returns from scarce resources allocated to health services. Another issue with these types of papers is that the epidemiological methods used to attribute cost to infection mostly fail to account for the timing of the infection during the hospital stay. This has been shown to bias upwards the estimates of attributable cost [5], providing a misleading picture of what costs might be saved in infection control was expanded [6].

The next paper was by Bauer-Savage et al. [7] who described work done in 2005 by the World Health Organization to develop and test two types of alcohol based hand rub that could be produced locally in low and middle income countries. They concluded the WHO formulations were easy and low cost to produce, and few barriers for their uptake were raised. This useful study shows that improving hand hygiene compliance is feasible and potentially low cost in resource constrained settings.

Next are eight papers that show how costs can be saved by making cost increasing investment for novel infection control programmes. Birgand et al. [8] compared the costs of using chromogenic selective medium with real-time PCR to detect patient colonized with glycopeptide-resistant enterococci. The extra costs of the rapid PCR test for GRE detection were well worth it. Quick decisions about infection control were made, reducing risks, and also preventing losses to hospital revenue as transfers and new admissions were not interrupted. This paper is a neat example of how spending a little extra for rapid diagnosis pays for itself, and presumably reduces risk for patients. For this argument to work however we need those who pay the extra cost to enjoy the cost saving. Budgets in silos can sometimes stop these sensible decisions from being made. Colston et al. [9] did a study in a 1400-bed National Health Service teaching hospital. They showed a policy of freezing intravascular line tips and only culturing them if there was a bacteraemia in the seven days before or after the intravascular was

worthwhile on economic grounds. This new policy was both cost saving and clinically acceptable, and if widely adopted might save the NHS 300,000 pounds a year. Gurieva et al. [10] used a mathematical modelling approach to show the costs and effects of MRSA screen and isolate strategies. A decision to screen patients who were previously known as carriers, possibly combined with screening of ICU-patients was found to be cost saving overall when the estimate of isolation efficacy was 25%. Higher estimates of efficacy meant more screening strategies were cost saving. Modelling studies are flexible and powerful research tools, but depend entirely on the data and assumptions used. Another modelling study was done by Merollini et al. [11] to show the cost-effectiveness of strategies to reduce the risk of surgical site infection in hip arthroplasty. Using antibiotic impregnated cement in addition to antibiotic prophylaxis was initially costly, but due to the effectiveness there were reductions in total costs and there were substantial health benefits for patients. They made another important point by finding that laminar air operating-rooms increased costs dramatically, mostly because risks of infection were elevated. This finding has been supported by others [12-16] and Zheng et al. (ref) has recently published a high quality systematic review of all the evidence for reducing surgical site infection among new hips [17]. Wintermans et al. [18] considered the cost-effectiveness of phenotypical testing that performs less well but is cheaper than genotypical tests for the detection of extended-spectrum beta-lactamases. They concluded more reliable results reduced unnecessary isolation days and then recommended the more expensive technology be implemented in the diagnostic laboratory. Zhou et al. [19] isolated Legionella spp., Pseudomonas aeruginosa, Mycobacterium spp. and filamentous fungi from the tap water of the Liver Transplant Unit in a Chinese hospital. They found point-of-use water filters removed the problems and that colonisation and infection with Gram-negative bacteria fell dramatically among patients. They suggest the modest investment in the filter would be cost-effective, although did not quantify the changes to cost and health benefits from the adoption decision. Balegar et al. [20] investigated whether prolonging hang time of total parenteral nutrition fluid impacted on central line-associated blood stream infection (CLABSI). They found no increase in rates and annual cost saving using of AUD $97,603.00; 68.3% of nurses in the study indicated that their workload decreased and 80.5% indicated that time spent changing TPN reduced.

Next found was a systematic review of economic evaluations of control interventions targeting MRSA in hospitals done by Farbman et al. [21]. They found 36 papers of which 18 reported the costs of the intervention and the costs saved. The components of the control strategies were summarised carefully, and estimates were made of total implementation costs in their review paper. Overall the studies included showed a favourable return on the costs of the prevention programmes. The savings reported were seven fold the costs of achieving them, and this does seem high. Any rational and risk neutral person who was offered $700 in return for an investment of $100 would accept immediately. Yet infection control professionals have to fight hard for their budgets, let alone extra investment. Hospital administrators must either not believe the studies, not understand them or do not get to enjoy the cost savings. There is a need to do high quality studies and disseminate them in terms that non-researchers understand and can critique, so they have confidence in the conclusions. There is also a need for infection control professionals to protect the economic savings and take credit for them when they arise. Reducing infections will free up bed days rather than save large amounts of cash [22]. This allows patients to flow into the hospital at a faster rate, reducing the average cost per case at a whole hospital level. Cost savings are only expressed as efficiency improvements and not cash released. A savvy infection control professional will show data on improved rates of infection over time, reduced length of stay and extra admissions to the hospital because they prevented cases of infection [22].

Page et al. [23] published a paper about the methods for costing infection control programmes. They stressed that most attempts to accurately cost infection control programmes presented accounting costs rather than economic costs. Six steps were proposed: to identify the precise aim of the costing study, to identify whose costs were to be included in the study, to establish a clear picture of all the resources needed to deliver the infection control programme, to establish measurement tools and a plan for data collection, to make assumptions or rules that would allow the costs of jointly used resources to be allocated to the programme, and to find appropriate dollar valuations for resources that represent the economic opportunity costs incurred from adopting the programme. Their paper is a useful guide for those who are motivated to accurately represent the costs of an infection control programme, or even go further and use their data in a full economic evaluation of an infection control decision.

Among the final five papers found were studies of decision support software [24] and only had a minor reference to infection control; the effects on patient safety of implant registries [25], with only limited application to infection control; the cost-effectiveness of farm interventions for reducing the prevalence of verocytotoxigenic Escherichia coli on UK dairy farms [26];and, the costs of investigating patients treated by a dentist accused of serious failures in infection control practice [27].

I was really encouraged by what has been published in 2013 on this topic by the infection control research community, because it represents an improvement on what has gone before. The infection control community has shown penchant for publishing information on the high costs that result from cases of nosocomial infection. There has been a preference to add as many noughts onto the dollar estimates as can possibly be justified. It was millions in the 1970s and 1980s, then it became billions and I hope we never make it to trillions of dollars lost to nosocomial infection. Scepticism arises because these big numbers arise from studies whose methods biased to give inflated results [28, 29]; they are designed to be alarmist and provoke a reaction from policy holders who hold the purse strings to patient safety budgets; and, most important, is that the massive savings promised are not realised when rates actually come down. This can only harm the credibility of the community in the eyes of policy makers who are promised so much from investing in infection control. Much better is what we have seen published recently. Sensible studies that consider both the cost increases and the savings, sometime quite modest, from adopting good infection control practice and sometime new technology are valuable for decision making. If costs are overall reduced from making a change then there is no need to show the health benefits in years of life gained or quality adjusted life years gained, as they represent the second 'win' after a cost saving has been achieved. If however the cost savings do not compensate the cost increase fully then the health returns need to be shown and a cost per life year gained statistic reported, to enable the value for money of infection control to be compared to the returns from other uses of scarce health dollars. Those doing economic studies in the field of infection control should always strive to do the best quality research, and publish in good journals. We might invest in training programmes for cost-effectiveness and encourage skills in economic evaluation.

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